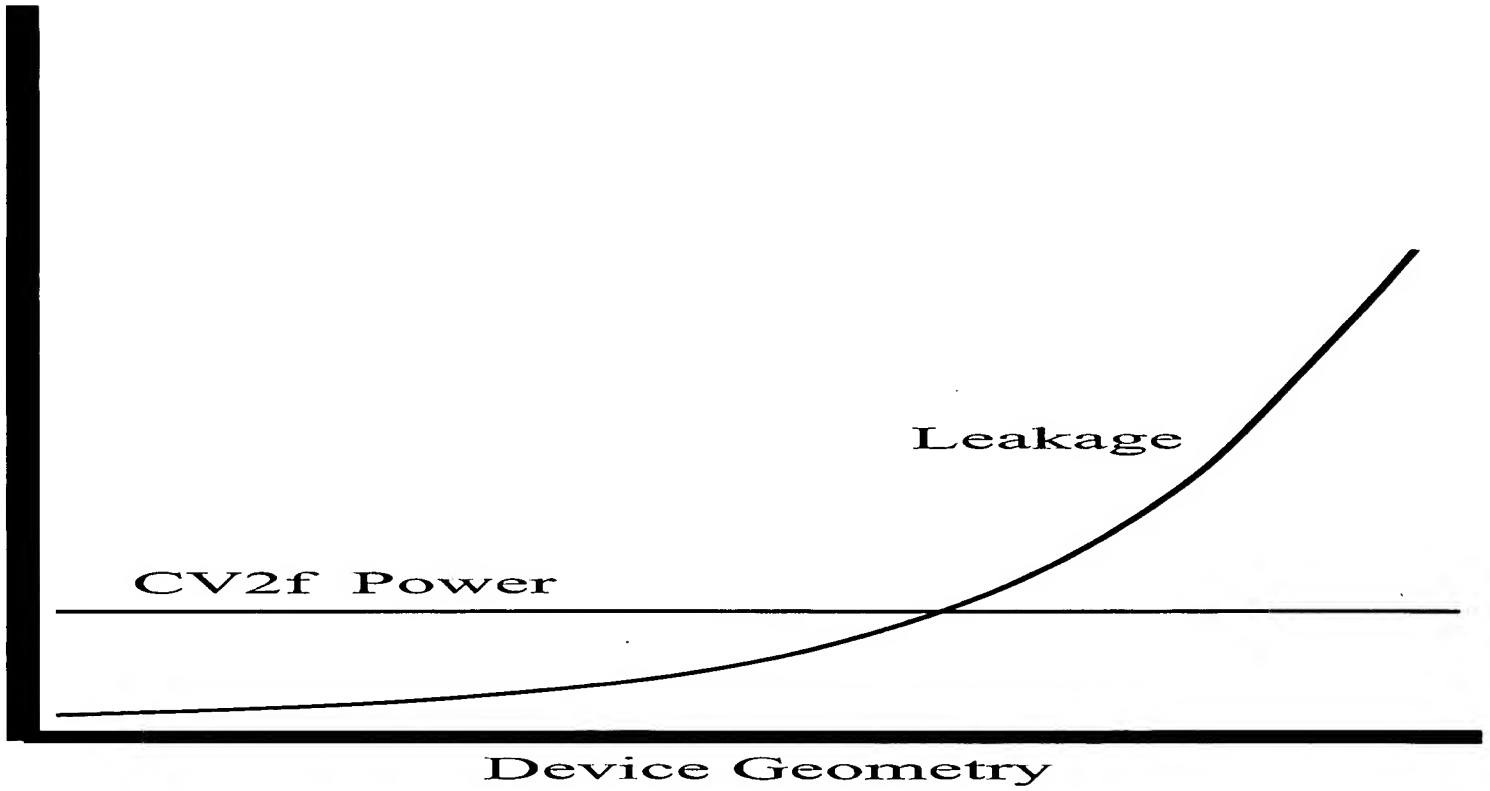
Device leakage is increasing as geometry shrinks.

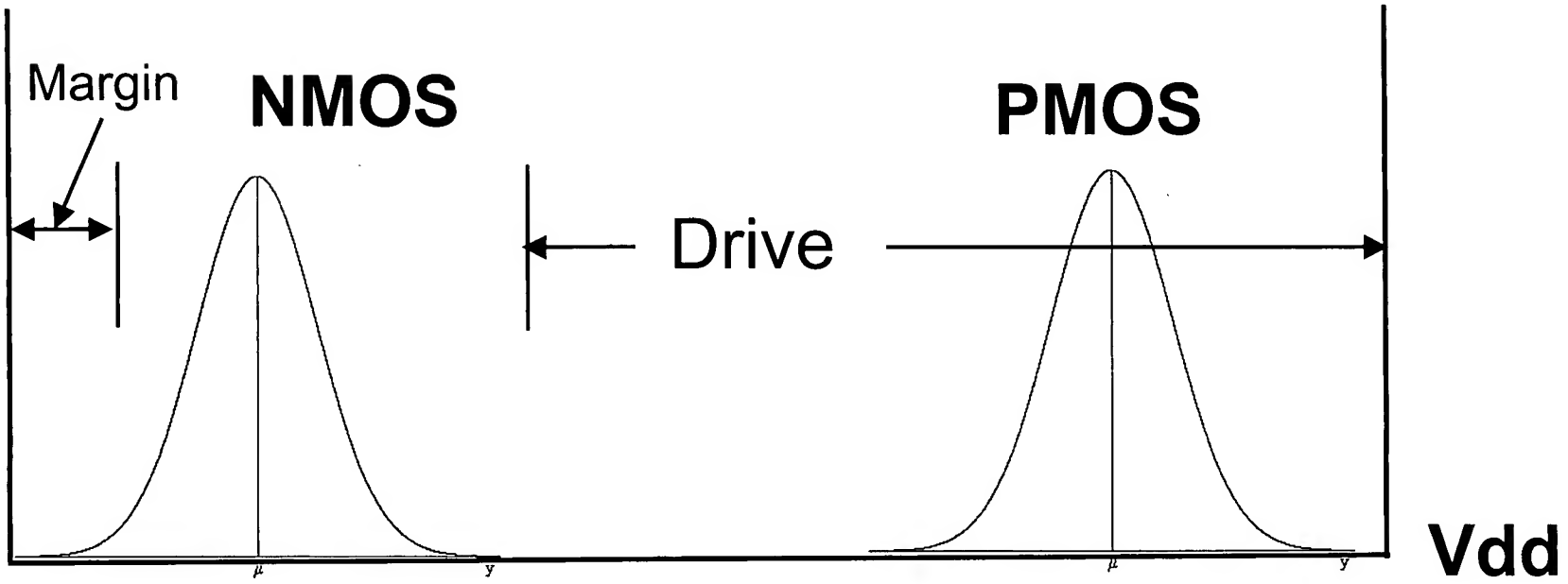


150 nm

65 nm

FIG. 1

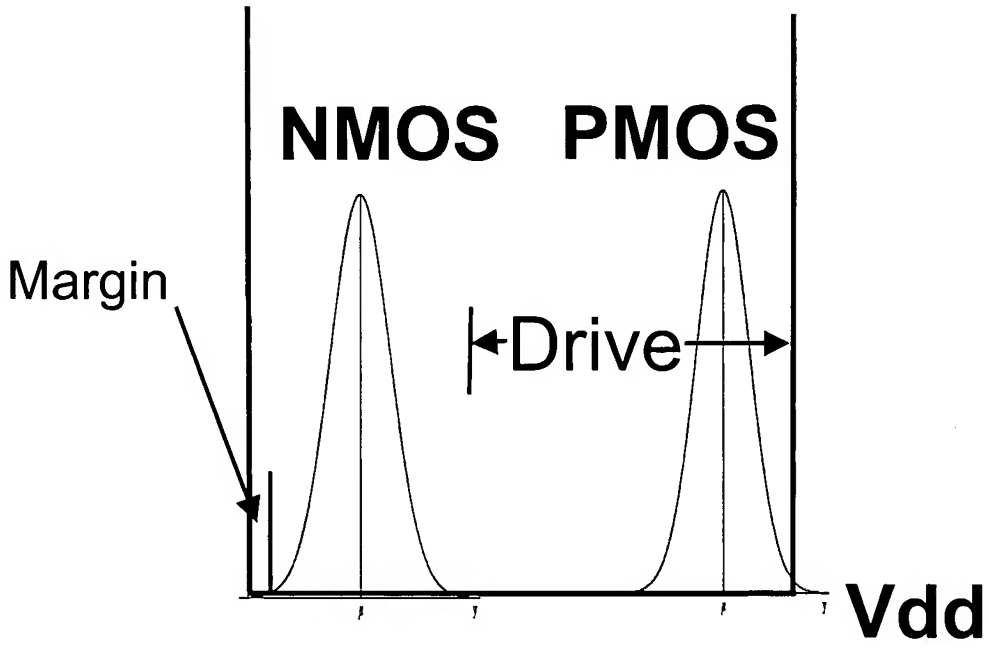
Margin vs. Drive Squeeze



Large Geometry Vt Distribution in the Power Supply Range

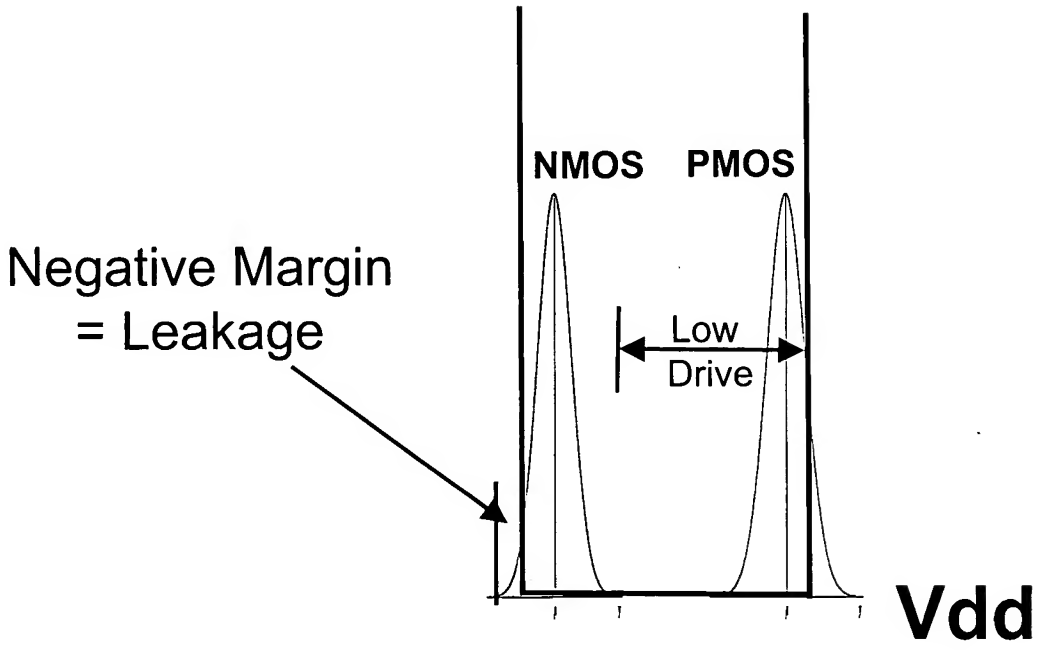
FIG. 2

Margin vs. Drive Squeeze



Smaller Geometry Vt Distribution in the Power Supply Range

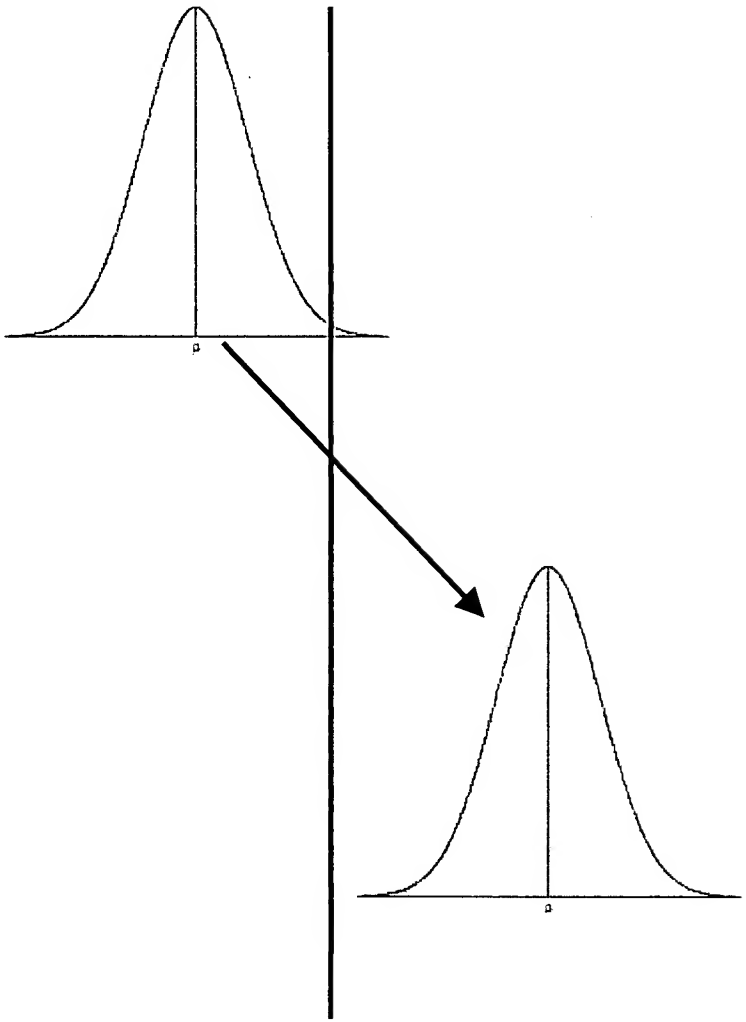
FIG. 3



Small Geometry Vt Distribution in the Power Supply Range

FIG. 4

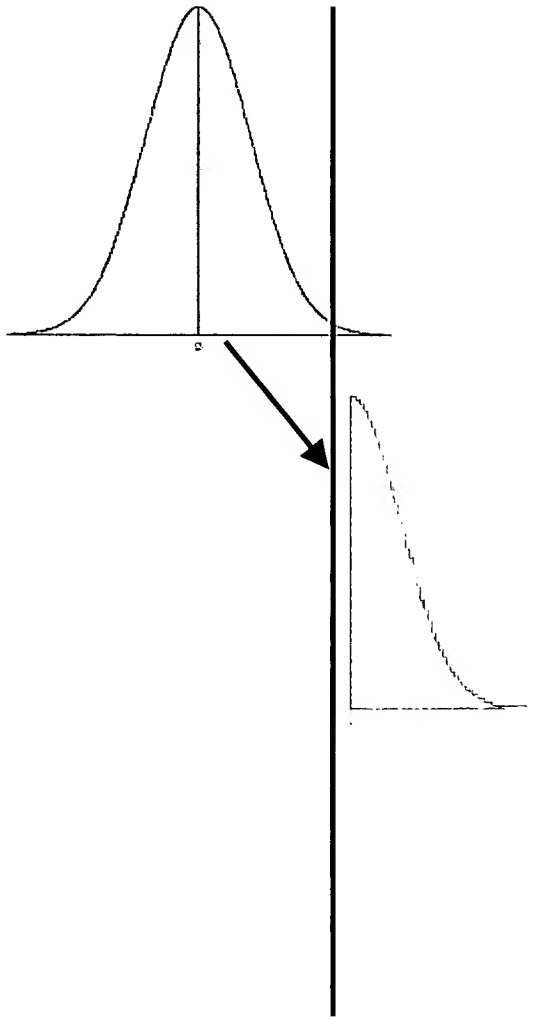
Passive Back Bias



No Leakage, but Vt Max is still high

FIG. 5

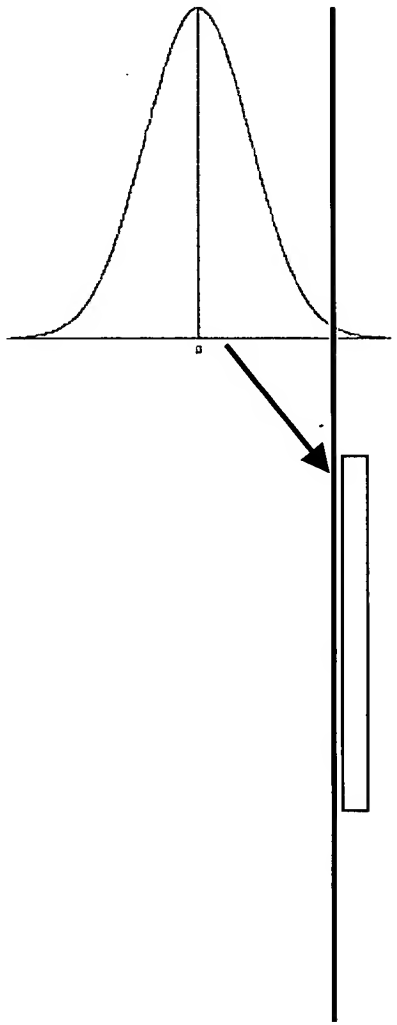
One bit Active Back Bias



No Leakage, but Vt Max is still high

FIG. 6

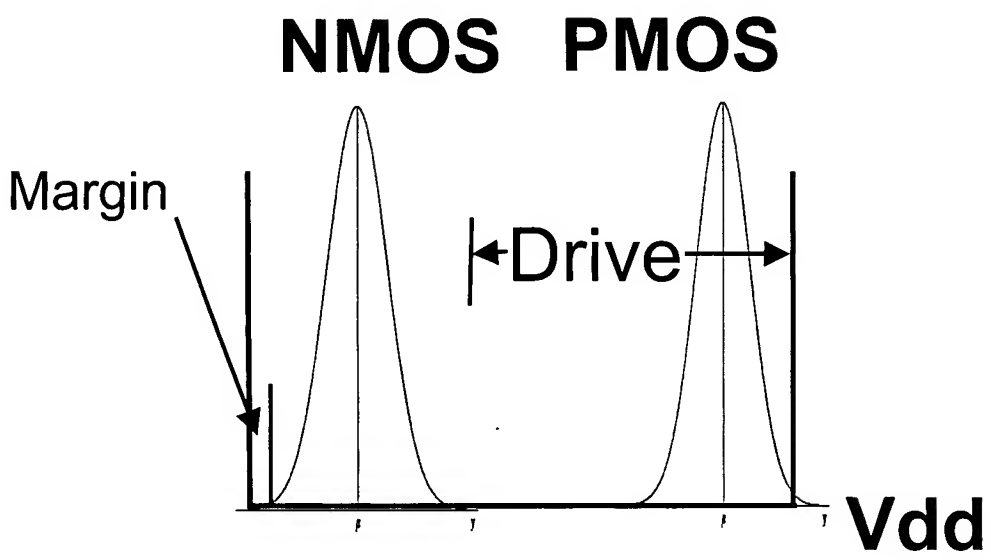
N-bit Active Back Bias



No Leakage, and Vt Max is greatly reduced

FIG. 7

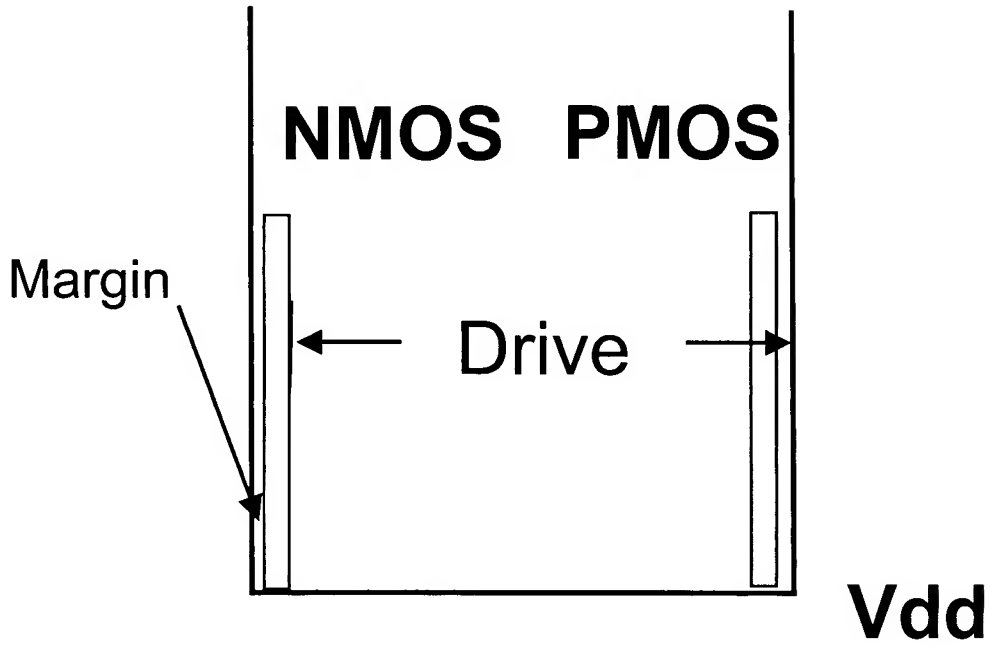
Margin vs. Drive Squeeze



Smaller Geometry Vt Distribution in the Power Supply Range

FIG. 8

Margin / Drive with N-bit Active Back Bias



Smaller Geometry Vt Distribution in the Power Supply Range with N-bit Active Back Bias

FIG. 9

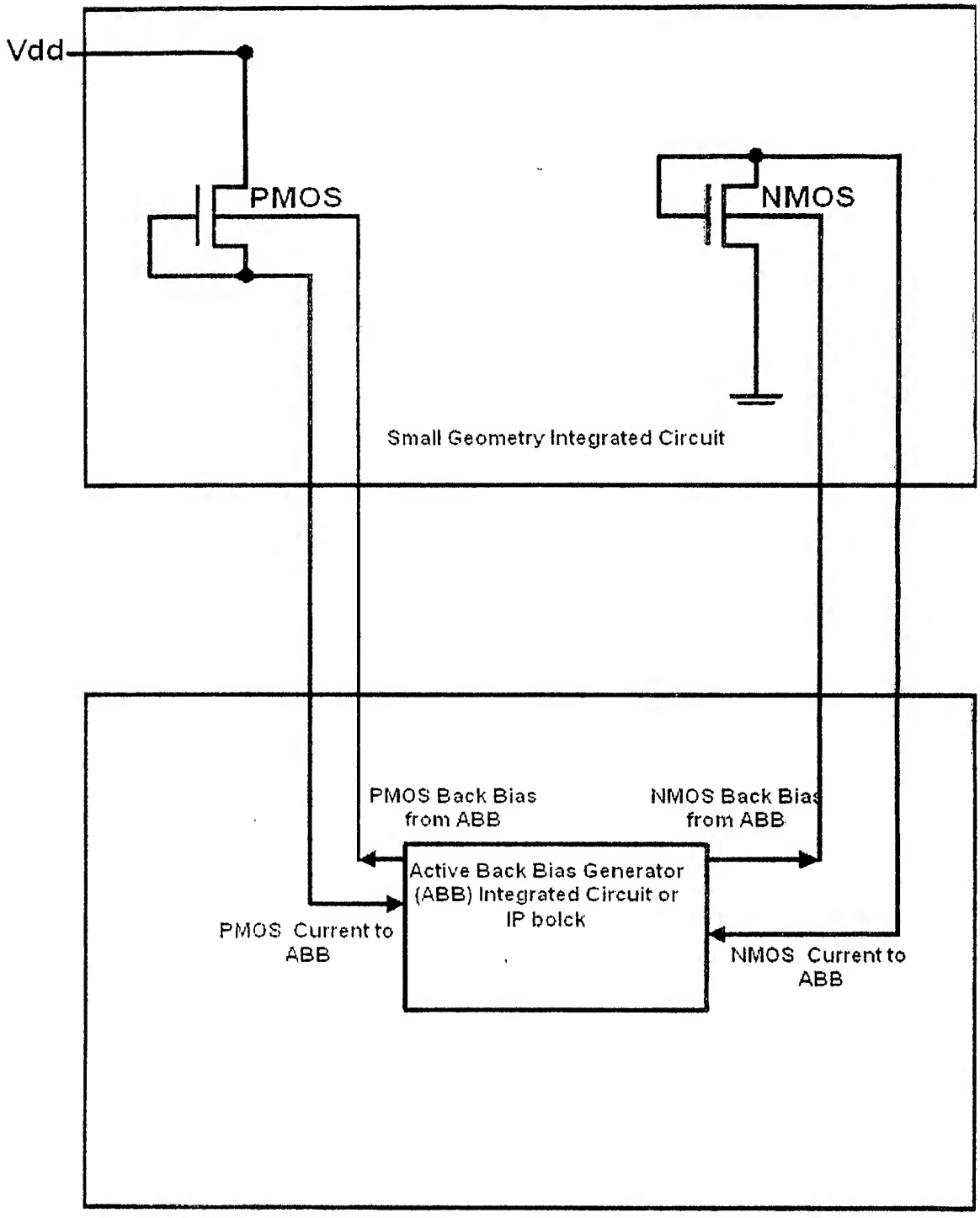

Vdd
PMOS
NMOS
Small Geometry Integrated Circuit
PMOS Back Bias from ABB
NMOS Back Bias from ABB
Active Back Bias Generator (ABB) Integrated Circuit or IP bolck
PMOS Current to ABB
NMOS Current to ABB

Fig. 10

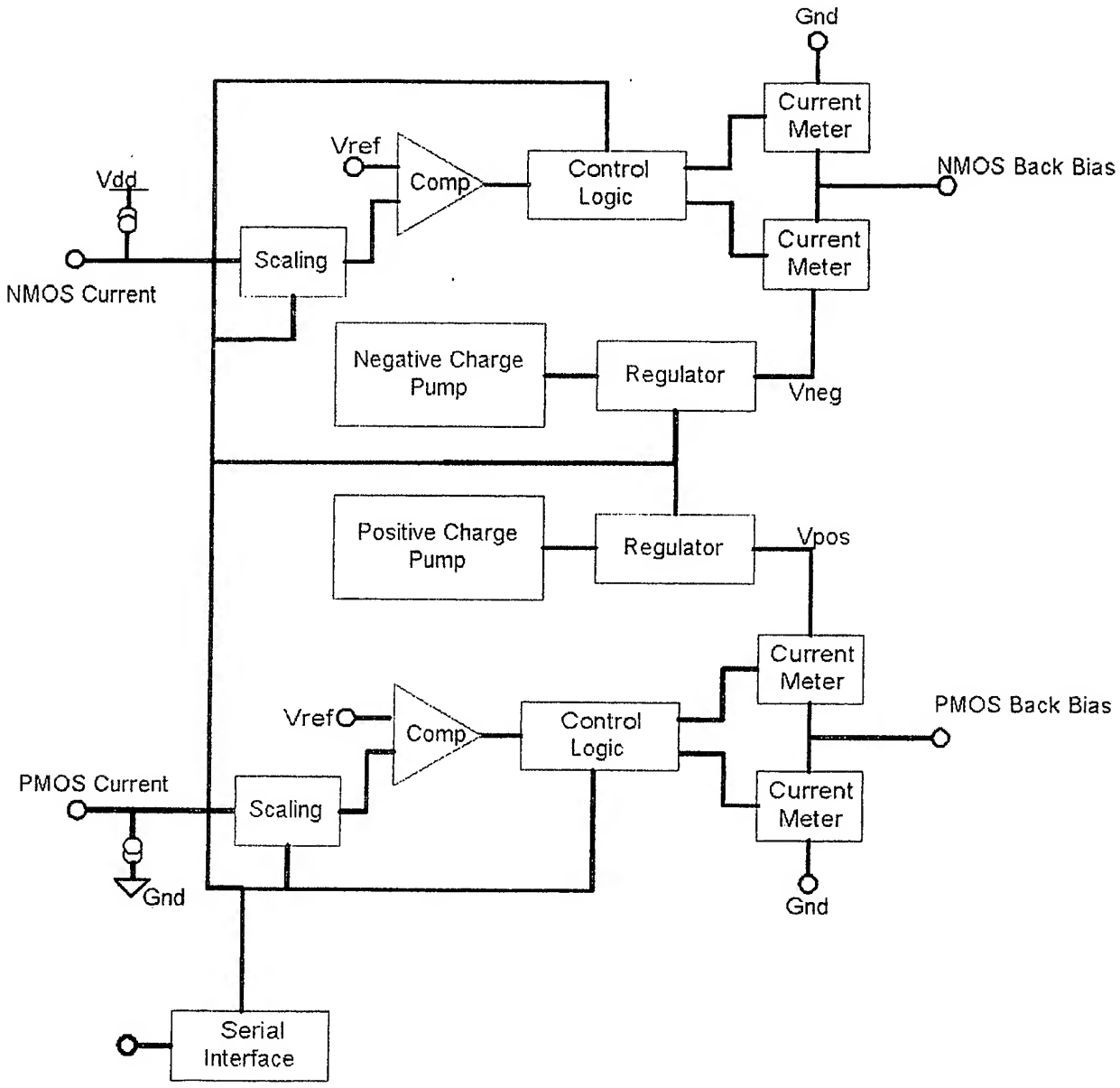

Gnd
Current Meter
NMOS Back Bias
Vref
Comp
Control Logic
Vdd
Current Meter
Scaling
NMOS Current
Negative Charge Pump
Regulator
Vneg
Positive Charge Pump
Regulator
Vpos
Current Meter
PMOS Back Bias
Vref
Comp
Control Logic
PMOS Current
Scaling
Current Meter
Gnd
Gnd
Serial Interface

Fig. 11